Where are the Large Banks?
Stress Tests and Small Business Lending

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Abstract

Bank small business lending dropped after the 2008 Financial Crisis and has seen very slow recovery, barely reaching 2001 levels. We show that post-crisis stress tests help explain this lack of recovery. Banks affected more by stress tests raise prices on small business loans and reduce quantity. The supply reduction affects risky, but not safe, small business loans. The price increases are concentrated in geographies where banks have branches, but the declines in quantities are concentrated where they do not. Banks price the implied increase in capital requirements from stress tests where they have local knowledge, and they exit markets where they do not.

I. Introduction

Credit to all classes of borrowers grew sharply during the run-up to the Great Recession, including loans to businesses, both large and small. Since the peak in 2007, however, bank originations of small business loans have fallen by almost 40% (Figure 1). Origination rates for these loans began to grow slowly starting in 2011. By 2014, however, new originations had only reached 2001 levels. Bank lending to large businesses, in contrast, has bounced back much more dramatically since the Great Recession – total C&I loans on bank balance sheets were about 72.4% *higher* in 2016 than in 2007 as compared to small business loans that in 2016 were 3.5% *lower* than in 2007 (Figure 2).

What explains the slow recovery in small business lending? One of the most prominent explanations has been increased regulation, including stress testing, which creates pressure on large banks' capital structure policies. The extant literature suggests that banks facing capital constraints cut their lending supply.[1] The Clearinghouse Association, an advocate for banks, points specifically to the stress tests as imposing unduly harsh (implicit) capital requirements on small business loans and on residential mortgages (Clearinghouse, 2017a and 2017b).

This paper solidifies the link between declines in bank small business lending and increased regulatory requirements.[2] We provide new evidence that stress tests conducted under Federal Reserve's Comprehensive Capital Analysis and Review (CCAR) led to a decrease in affected banks' credit supply to small businesses. Banks more affected by stress tests reduce

[1] A large literature on bank "capital crunches" documents that shocks to bank equity capital have large contractionary effects on the supply of lending (Bernanke 1983, Bernanke and Lown 1991, Kashyap and Stein 1995, 2000, Houston, James, and Marcus 1997, Peek and Rosengren 1997, 2000, Campello 2002, Calomiris and Mason 2003, Calomiris and Wilson 2004, Cetorelli and Goldberg 2012).

[2] Whether or not the implicit capital requirements on small business lending embedded in the Federal Reserve's model is too high or not lies beyond the focus of our paper. Answering this question is important, as it affects the normative conclusions one should draw from our results, yet it is challenging since the Federal Reserve does not disclose the details of its models. Consequently, we remain agnostic on this question.

quantity and raise prices on small business loans. The supply reduction is especially pronounced in volatile local economies and among risky small business borrowers. Banks more affected by stress tests also tend to exit the markets where they do not have branches and thus possess limited local information; in contrast, price increases are concentrated where banks do have branches.

Comparing stress tested banks with non-tested banks is problematic because only large banks face these tests, yet they differ from small banks in many ways beyond differences in regulation. We therefore focus solely on the group of 32 stress-tested BHCs (and their subsidiary banks), using a new measure - *Stress-test shock* - to capture cross-sectional variation in their exposure to the test. Our *Stress-test shock* equals the difference between the BHC's current capital ratio and the lowest implied capital ratio expected under the stress-test scenarios.[3] Stress tests provide a systematic measure of how much a bank might lose during a hypothetical severe economic downturn, which then gets translated into a forecast of its regulatory capital ratios conditional on various stress scenarios. Banks expected to experience larger capital declines under stress-scenarios (large values of *Stress-test shock*) are likely to face the most pressure from the regulators either to reduce their current loan portfolio risks or improve their current capital ratios (e.g., by reducing planned dividend distributions and/or share repurchases). We utilize the publicly available data on the stress-testing results in 2012 through 2016 to build the *Stress-test shock* variables based on three capital ratios: the Tier 1 Capital Ratio, the Total risk-based Capital Ratio, and the Tier 1 Leverage Ratio, although our results are similar across all three.

To strengthen our identification, we exploit heterogeneity in the effect of *Stress-test shock* by small business lending risk. Risk matters for several reasons. First, there is a direct link

[3] The Federal Reserve specifies three scenarios – baseline, adverse and severely adverse – and estimates the path of each bank's capital under each scenario over a nine-quarter planning horizon. We focus on the results from the severely adverse scenario, as it is most likely to constrain a bank's capital planning.

between the stress-testing-induced pressure to increase capital and loan risk. By reducing the risk of their loans, banks can loosen capital requirements and thus ease related regulatory pressure. Second, by requiring banks to hold more capital, the stress tests may also reduce the moral hazard incentives to engage in excessive risk-taking stemming from underpriced deposit insurance or too-big-to-fail protections (e.g., Strahan, 2013; Acharya, Mehran, and Thakor, 2016). Consequently, we expect the effect of banks' *Stress-test shock*s to be more pronounced among riskier borrowers and/or riskier local markets.

To further strengthen our identification, we also compare bank behavior based on access to local information. If small business loans are just commodities, then all of the variation in credit supply at the individual bank level would manifest in quantities rather than prices. Yet a large stream of banking literature argues that small business lending often relies on soft information which requires lenders to know and develop long-lasting relationships with their borrowers.[4] Following earlier papers, we proxy access to local information based on whether or not a bank owns a branch near the borrower. Physical proximity both improves information production at the outset of lending relationships and allows for better loan monitoring over the course of that relationship. In such cases, banks exposed to larger *Stress-test shocks* would be expected to increase prices, leading to smaller declines in quantities than would be expected in cases where banks lend without a physical presence.

We start our analysis by evaluating annual small business loan originations using data collected under the *Community Reinvestment Act* (CRA). These data capture growth in small business lending at the bank-county-year level and thus allow us to absorb potential demand-side confounds with granular county-time fixed effects. We build a county-level measure of local

[4] See, e.g., Degryse and Ongena (2005); and Berger et al (2005); Agarwal and Hauswald (2010); Gilje (2017).

economy risk based on the sensitivity of local employment to overall national employment (similar to market beta). Using this new measure, we document that relative to less-affected banks, those more affected by the stress tests reduce the quantity of lending to small businesses in risky markets relative to safe markets. The effect on quantities is most pronounced in markets (counties) where banks do not have branches and thus lack the informational advantage to price in the higher risk.

To investigate the effect of stress tests on prices, we next turn to the *Survey of Terms of Business Lending* (STBL). These data provide loan-level price and non-price terms at quarterly frequency for a sample of randomly selected banks' lending to businesses. Specifically, the STBL collects data on new loan originations during a full business week each quarter from each bank in the survey. Since the STBL skews its sampling procedures toward large banks/BHCs, it captures loans originated by about 26 out of 32 main banks owned by the stress-tested BHCs in our sample. The STBL data offer a number of advantages. First, it provides detailed data on loan conditions such as the interest rate, the commitment amount, maturity, collateral, etc. Second, each bank reports its internal assessment of loan risk on a 1-4 scale, which we exploit in some of our tests. In contrast to the CRA data, which reflect *all* of a bank's new lending within each county, the STBL offers data on individual loans originated by a subset of banks during a full business week window in each quarter and only offers state-level location of a borrower.

Using the STBL data, we document that banks more affected by the stress tests charge higher prices on their loans to small businesses, consistent with an inward shift in credit supply from pressure on the bank's capitalization from the tests. The result is quantitatively important. A one standard deviation increase in a bank's *Stress-test shock* leads to an increase of about 40 basis points in the rate charged on their small business loans, which is large relative to the overall variation in loan rates (standard deviation = 127 basis points). The size of our estimated effects increases when we control for other loan terms such as loan maturity and collateralization. This effect on prices is significantly stronger in the areas (states) where banks have a local branch presence and hence possess informational advantage. A one standard deviation increase in a bank's *Stress-test shock* leads to about a 55 basis point loan price increase in a bank's local markets, whereas it leads to just a 15 basis points increase in non-local markets.

In our last tests, we contrast the effect of exposure to stress tests on risky versus safe loans. We find that the effect of *Stress-test shock* on the pricing of safe loans is near zero or perhaps even slightly negative, reflecting shocked banks' desire to supply more low-risk credit. In contrast, *Stress-test shock* leads to higher prices for small business loans in the two highest loan risk categories, with larger effects when these risky loans are made near banks' branch domains. Among these local, risky loans, a one standard deviation increase in a bank's *Stress-test shock* leads loan price to increase by approximately 70 basis points. Consistent with these pricing patterns, the share of loans originated to safe borrowers increases with exposure to the stress tests. And, this shift toward safe loans happens largely in non-local markets (i.e., those outside banks' branch domains). The effects of stress tests on pricing of risky loans is therefore strongest where banks have access to local information, while its effects on quantities are strongest where they do not.

Overall, our evidence suggests that in response to *Stress-test shock*s banks reduce the supply and increase the cost of small business loans. They exploit intensive and extensive margins to rebalance their loan portfolios toward less risky loans and to boost their capital. Specifically, banks reduce the supply of risky loans in geographies where they do not have an information advantage and hence cannot charge higher interest rates. They increase loan prices and reduce the credit supply to a smaller extent in the geographies where they can extract informational rents.

The results are unlikely to reflect reverse causality – meaning a connection running *from* bank loan supply *to* its outcome in the stress tests – for a number of reasons. First, the stress tests themselves are affected by the whole bank portfolio, and small business lending is a small component of the overall portfolios of large banks. Second, we use lagged values of the stress test to allay concern about timing; for example, we merge stress test results disclosed in March 2012 to the four subsequent quarters of STBL data (starting in May of 2012). Third, any reverse causality would predict exactly the opposite of what we find. That is, reverse causality would predict that banks supplying more risky loans would be more affected by the stress test, which is the opposite of what we find. Our results are also unlikely to be related to credit demand. Our empirical strategy strips out any potential market-specific shock at annual/quarterly frequency that might reflect demand conditions, yet whether or not we include these effects matters little to the size of our main coefficient.[5]

This paper contributes to a few strands of literature. First, and foremost, it links the increase regulatory pressure on large banks and the decline their willingness to supply small business loans following the 2008 Financial Crisis and the Great Recession. This dearth of credit has been costly to local economies. Chen et al. (2017) show a sharp decline in lending at the largest banks and offer evidence that this decline has hurt local economies more exposed to these large banks. We thus add to the literature that documents the adverse effect of stress-tests on credit supply. Acharya, Berger and Roman (2017) document that stress tested banks reduce large corporate loan supply and increase prices particularly for riskier borrowers, while Bassett and Berrospide (2017) do not find any negative impact of *Stress-test shock*s on bank loan growth in

[5] Including these effects, rather than just time effects, increases R^2 by about 60%.

general. We add to this literature by documenting the effect of *Stress-test shock*s on small business loans and documenting the heterogeneity in these effects across intensive and extensive margins.

Second, existing research suggests that small businesses have better access to credit if their local market contains more small banks and that this effect has gotten larger during the post-crisis period (e.g., Berger et al., 2017). Yet the banking industry continues to evolve toward one dominated by large banks and by banks relying heavily on non-traditional funding sources like securitization. Not surprisingly, the share of bank assets in the largest banks has grown steadily over time, as has their share of small business loans. These trends raise concern over the future of credit availability for small business loans. This paper shows that the concerns for stability of the financial industry in general, might have reduced the supply of credit to the small business -- "the backbone of the U.S. economy." In the conclusion, we discuss the normative implications of our findings.

II. The Stress Tests

The 2008 Financial Crisis led to dramatic changes in regulation and supervision of financial institutions, many of which come out of compliance with measures laid down by the Dodd-Frank Act (DFA). DFA requires the Federal Reserve to conduct annual stress tests of a select group of large bank holding companies (BHCs) and non-bank financial institutions designated for stress-testing by the Financial Stability Oversight Council (FSOC).[6] Prior to passage of DFA in 2010, the 2009 Supervisory Capital Assessment Program (SCAP) represented the first stress testing effort. The SCAP aimed to ensure that banks had sufficient capital coming out of the crisis to absorb losses under poor economic conditions but continue to be able to supply credit to the

[6] For the purposes of the discussion in this section, we use the term 'bank' to refer to bank holding companies and other financial firms subject to stress tests.

economy, thereby short-circuiting a negative feedback loop between real shocks and financial shocks.

Under SCAP, the Federal Reserve assessed the level of regulatory capital for the 19 largest banks under three potential paths of the economy. Nine banks ‘passed’ SCAP stress tests and continued operating without needing to raise new equity capital. Of the remaining banks, all but one succeeded in raising sufficient capital in private markets to meet their required capital ratio. The remaining institution came into government conservatorship and was later privatized. SCAP induced rapid re-capitalization of the large banks and was widely seen as a successful turnaround of bank financial conditions coming out of the crisis.

Following the success of SCAP, the Federal Reserve continued to implement supervisory stress tests, re-named the Comprehensive Capital Analysis and Review (CCAR). CCAR called for annual tests of whether large banks have sufficient capital to absorb a substantial economic and financial downturn, yet continue to be able to provide credit. CCAR began in 2011 with the same large banks as in the SCAP, those with total assets in excess of $100 billion. In 2012, however, the Federal Reserve expanded the set of banks required to undergo stress tests to 32 banks with assets above $50 billion.[7] The tests are conducted over three to six months, and then reported in March of each year. In 2016 the report date for the stress test disclosure was moved to June.

The stress tests forecasts three possible scenarios for each bank’s regulatory capital ratios nine-quarters into the future (‘baseline’, ‘adverse’ and ‘severely adverse’). The scenarios capture possible paths for aggregate economic variables. The 2017 Federal Reserve *Supervisory Scenarios for Annual Stress Tests Requirements under the Dodd-Frank Act Stress Testing Rules and the*

[7] In 2014, the stress test process was expanded to banks with total assets between $10 and $50 billion through the Dodd Frank Act Stress tests, which operate in parallel with CCAR. However, stress tests of banks with assets between $10 billion and $50 billion are not supervised by the Federal Reserve.

Capital Plan Rules require modelling "(s)ix measures of economic activity and prices: percent changes (at an annual rate) in real and nominal gross domestic product (GDP); the unemployment rate of the civilian non-institutional population aged 16 years and over; percent changes (at an annual rate) in real and nominal disposable personal income; and the percent change (at an annual rate) in the Consumer Price Index."[8] Thus, the scenarios focus on aggregate rather than idiosyncratic risks of banks. This approach helps minimize the macro-prudential risk of banks becoming capital constrained collectively during broad economic downturns. The Federal Reserve also develops a model to map the effects of the hypothetical economic and financial variables on each bank's capital.

Alongside the scenarios and models provided by the Federal Reserve, the stress testing also requires two ingredients provided by banks: (i) data on individual banks' positions and exposures to various risk factors; and (ii) banks' planned capital distributions (or sales of new equity). Thus, the results of the stress tests reflect common scenarios and a common model (i.e., the one developed by the Federal Reserve), but they reflect each bank's specific asset composition and plans for capital distributions. The results are closely watched, not only by regulators, but also by banks and market participants, as they might lead to reductions in planned capital distributions, as well as other operating changes if the simulated decline in capital is sufficiently large.

Measuring Exposure to Stress Test

We construct three measures of *Stress-test shock* for each tested banking institution based on stress test results disclosed publicly by the Federal Reserve for years 2012-2016. These data offer the implied (modeled) capital ratios banks would experience with the most adverse stress

[8] See https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20170203a5.pdf.

scenario. Specifically, the Federal Reserve reports the minimum Tier 1 Capital ratio, Total Risk-Based Capital ratio, and Tier 1 Leverage ratio expected over the forward-looking nine-quarter planning horizon for each of the annual tests.[9] An implied minimum capital ratio significantly below the current capital ratio would indicate that the bank's losses would impair its equity position and hence threaten its ability to extend credit. The bigger the expected decline in a bank's equity capital, the more likely the regulatory authority is to interfere and pressure the bank, either with regard to its capital planning or the risks in its portfolio of assets.

In line with this intuition, our measure of *Stress-test shock* equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. BHCs whose specific portfolios have the greatest downside risk under the test will have the largest value of *Stress-test shock.* These are the banks likely to face pressure from the regulators, either to reduce risk or improve their current capital ratios (e.g., by reducing planned dividend distributions and/or share repurchases). The measure is unlikely to be endogenous to banks' small business lending as it is driven by a bank's entire loan portfolio of which small business constitute only a very small fraction.[10]

Panel A of Table 1 reports the summary statistics. The three measures of *Stress-test shock* average between 2.6 and 3.4 percentage points (or 2.3 to 3.1, at the median). These capture how much the typical bank's capital ratio would be expected to decline over the stress scenario. These modelled declines are economically significant, as they are similar in magnitude to one standard deviation change in the corresponding capital ratio. The *Stress-test shocks* varies substantially

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[9] The banks also report similar results from their own models. These results, however, are less stringent than those based on the Federal Reserve's proprietary models about 75% of the time. Hence, we focus on the results from the Federal Reserve model, as it generally reflects the most binding constraint faced by banks.

[10] For example, among banks with assets over $50 billion, small business loans outstanding averages less than 5% of their total assets (less than 3.5% since 2011). Hence, there is little possibility of reverse causality.

across banks as well, with a standard deviation of 1.3 to 1.7 percentage points, depending on the capital ratio.

Stress Test Related Literature

A number of studies have tried to assess the utility of stress tests in addressing some of the deficiencies in capital requirements and bank supervision that emerged in the wake of the Financial Crisis. One stream of literature focuses of stress tests efficacy. Hirtle et al. (2009) offer an early discussion of ways to use stress testing to improve bank supervision. Schuermann (2016) broadens the discussion of policy by contrasting its use during good times versus bad times. Frame et al. (2015) offer some empirical evidence calling into doubt the utility of stress tests by analyzing pre-crisis stress tests done by the regulator of Fannie Mae and Freddie Mac.

Other work evaluates the implications of public disclosure of stress-test results. Goldstein and Leitner (2017) analyze theoretically the tradeoffs faced by regulators regarding disclosure of stress test results. Several papers have studied market reactions to U.S. or European stress test announcements, with mixed evidence of whether banking firms experience significant abnormal average stock returns when supervisory stress test results are disclosed (Peristiani et al., 2010; Petrella and Resti, 2013; Candelon and Sy, 2015; Bird et al., 2015; and Fernandes, Igan and Pinheiro, 2015). Flannery et al. (2016) argue that stress test disclosures reveal information to market participants, both negative and positive, thereby explaining the mixed results from directional event studies. They show that price volatility and volume increase reliably around disclosure dates.

Finally, a line of studies evaluate how bank exposure to stress tests affects their risk-taking and other operating decisions. These studies are closest to ours. Acharya, Berger and Roman (2017), for example, document that stress tested banks reduce large corporate loan supply and increase prices, particularly for riskier borrowers. Bassett and Berrospide (2017) evaluate banks' balance sheet loan volumes and do not find a negative effect of stress tests on bank loan growth in general. Calem, Correa, and Lee (2016) offer similar evidence in the market for jumbo mortgages. Cornett et al. (2016) study adjustments to bank dividends and overall measures of investment from Call Report data, finding that stress tested banks are more likely to cut dividends and reduce lending. We add to this literature by documenting the effect of *Stress-test shock*s on small business loans and documenting the heterogeneity in these effects across intensive and extensive margins.

III. Empirical Tests and Results

In this section, we describe our empirical strategy, followed by presentation and interpretation of results. To alleviate the identification problem stemming from stress-tested banks being different from non-stress-tested banks in many ways that extend well beyond the effect of CCAR regulation, we abstain from comparing lending of stress-tested and inherently different non-stress-tested banks. Rather, we focus solely on the group of 32 stress-tested banks. We start by evaluating the effects of *Stress-test shock* on small business lending quantities, followed by the analysis of the effect on loan pricing.

III.A. Stress Tests and Small Business Loan Quantities

To capture the response of small business loan quantities to *Stress-test shock,* we exploit CRA loan originations data from 2012-2015, collected by the Federal Financial Institutions Examination Council at the subsidiary-bank-level.[11, 12] CRA focuses on loans with commitment

[11] See, e.g., Bord, Ivashina, and Taliaferro (2017) for a more comprehensive description of CRA data.

[12] As of the date of this draft, the 2016 CRA data was not yet publicly available.

amounts below \$1 million originated by financial institutions with more than \$1 billion in assets.[13] Under CRA, the banks report small business loans at a granular, community (county) level. Consequently, CRA data provide us with a complete record of new lending quantities by subsidiary banks of the stress-tested entities (bank holding companies, or BHCs) at the county-year level.

We use CRA to build the annual growth rate of new loan originations under \$1 million, which we interpret as loans to small businesses. The purpose of the CRA is to "encourage ensured depository institutions to help meet the credit needs of the communities where they are chartered." Individual subsidiary banks within stress-tested BHCs will have different incentives and obligations to "meet credit needs" of the communities they serve. Consequently, we do not aggregate CRA data to BHC level, but rather build the growth measures for subsidiary banks and map in *Stress test shock* for each bank's BHC owner. In the regressions, we also control for these subsidiary banks' financial characteristics provided by the Report of Income and Conditions (Call Report) data. The resulting sample covers banks owned by 28 out of 32 stress-tested entities, since some of the stress-tested institutions did not conduct any lending that fell under CRA guidelines.

To mitigate the effect of outliers (e.g., due to a small denominator) we normalize the year-to-year change in lending volume by the mid-point of originations between the two years, as follows:

$$\text{Loan Growth}_{i,c,t} = \frac{\text{Loan Originations}_{i,c,t} - \text{Loan Originations}_{i,c,t-1}}{(\text{Loan Originations}_{i,c,t} + \text{Loan Originations}_{i,c,t-1})/2} \quad \textbf{(1)}$$

where i represents the bank, c represents county, and t represents year. With this definition, the variable is bounded above (+2) and below (-2). Furthermore, to eliminate noise stemming from

[13] The asset-size threshold for CRA data reporting was \$250 million before 2005 and raised to \$1 billion in 2005.

counties with insignificant amounts of loans originated by a given bank, we restrict our sample to markets where a given bank made at least 5 loans in period $t-1$.

We then match the CRA small business-loan-growth data and *Stress-test shock* data by, first, mapping subsidiary-banks to stress-tested BHCs. The stress tests are typically conducted over a three to six-month period with the final report published in March.[14] This timing inhibits our ability to perfectly capture the consequences of the stress tests in annual CRA data. In our matching procedure, we assume that the majority of the effect from the *Stress-test shock* is likely to manifest within the next nine months of the year of stress test result disclosure. In line with this assumption we match, for example, CRA loan growth from December 2013 to December 2014 to the stress test results reported in March 2014.

Panel B of Table 1 provides summary statistics of financial characteristics of subsidiary banks. The sample covers a set of relatively large banks with average total assets of $260 billion. The traditional financial characteristics are in line with other studies exploring large banks. Notably, while in aggregate the small business lending grew post 2008 (slowly but grew) as evident from Figure 1, the banks in our sample on average experience 8.5% annual decline in small-business-loan originations.

To evaluate the effect of stress tests on small business loans, we implement the following regression analysis:

$$\text{Loan Growth}_{i,c,t} = \beta_1 Stress\ Test\ Shock_{h,t} + \text{Bank Controls}_{i,t-1} + County \times Year\ FEs + \varepsilon_{i,c,t} \quad \textbf{(2)}$$

[14] In 2016, the Federal Reserve started publishing the stress test results in June. Yet this shift does not apply to our CRA results as CRA data only covers 2012-2015 period.

where we evaluate the annual growth in loan originations by subsidiary bank i of BHC h in county c in year t. The set of (subsidiary) bank controls includes log of total assets, share of C&I loans in a bank total loan portfolio, share of non-performing loans in total loans, return on assets, share of deposits in total liabilities, and a bank's liquidity captured by the ratio of cash and marketable securities to assets. We also control for the BHC-level initial capital ratio corresponding the stress-test capital measure. All bank control variables are as of the beginning of the year to avoid reverse causality concerns. As discussed earlier, we use the *Stress-test shock* variable in the same year *t* since the stress tests are conducted early in the year and, hence, affect bank-lending behavior through the rest of the CRA period. We cluster the standard errors by BHC-year, as this is the level of variation for our core variable of interest.

We expect that more severe *Stress-test shock*s are associated with declines in small business lending ($\beta_1 < 0$). We eliminate potential credit-demand-driven explanation for our results by incorporating high granularity county-year fixed effects that fully capture local economic conditions ultimately affecting small business credit demand. Effectively, we compare banks operating in similar markets (and serving similar borrowers), but facing different exposure to the *Stress-test shocks*.

One can argue, however, that the CRA loan growth response to *Stress-test shock*s might also be subject to an unobserved heterogeneity bias. Banks more inclined to grow their (relatively riskier) C&I lending, would experience larger capital stress-induced declines and hence higher *Stress-test shock* values. This would induce an upward bias in our coefficient of interest. To mitigate this identification challenge, we exploit heterogeneous predictions based on risk and access to information. If, in response to a stress-test shock, a bank attempts to reduce the riskiness of its loan portfolio, then we should observe more severe declines in small business lending to riskier borrowers or in riskier markets. Conversely, in markets where banks have access to local information, they can raise prices on risky loans, while in markets without such pricing power adjustments in loan volumes ought to be larger.

Since CRA data do not provide information about individual borrower characteristics (e.g., borrower risk), we build an alternative risk measure. Specifically, we develop a new proxy that captures variation in risk at the county level, rather than at the borrower level. Using county employment data, we construct the '*employment Beta.*' Similar to a stock Beta, our proxy captures the sensitivity of a county's employment growth to changes in national employment growth. We first estimate industry-level employment betas using aggregate county-level and economy-level quarterly data on employment growth from 1992 through 2015. We then compute county-year-level employment Beta as a weighted average of industry-level Betas, based on share of different industries in each local economy:

$$\text{Employment Beta}_{c,t} = \sum \omega_{c,j,t} \times \text{Employment Beta}_{j} \quad \textbf{(3)}$$

where $\text{Employment Beta}_{j}$ is the time-invariant estimate of industry j's employment Beta and $\omega_{c,j,t}$ is the share of jobs provided by industry j in county c at time t. Intuitively, the county employment beta is an industry portfolio beta of a given county at a given point of time. This measure meshes well with the intent of the stress test scenarios, which typically contemplate bad outcomes for economic and financial aggregates such as U.S. GDP growth and changes in the overall unemployment rate. Hence, counties whose economies move in lock-step with the overall economy will have greater effects on the results of stress tests.

Armed with a granular measure of local economic risk, we evaluate the response of small business lending volumes to stress-test shocks using the following model:

$$\text{Loan Growth}_{i,c,t} = \beta_1 Stress\ Test\ Shock_{h,t} + \beta_2 Stress\ Test\ Shock_{h,t} \times \text{Empl Beta}_{c,t-1} + \text{Bank Controls}_{i,t-1} + County \times Year\ FEs + \varepsilon_{i,c,t} \quad \textbf{(4)}$$

Table 2 reports the results with Panels A, B and C exploiting the *Stress-test shock*s based on the Tier 1 Capital Ratio, the Total risk-based Capital Ratio, and the Tier 1 Leverage Ratio, respectively. Column (1) reports simple models without the interaction term. The coefficients β_1 are not statistically significant, potentially reflecting the upward bias discussed earlier. Column (2) reports equation (4). The coefficient β_2 is negative in all three cases and statistically significant in two out of three. The results suggest that *Stress-test shock* leads affected banks to reduce small business lending more in risky local markets than in safer ones.

In column (3) of Table 2, we absorb all sources of bank-level heterogeneity by introducing bank-year fixed effects. In this setting, the direct effect of the *Stress-test shock* is fully absorbed, so we focus on the differential across market types. This approach is appealing in this setting because, although we lose identification on β_1, we can still identify the interaction term (β_2) while absorbing possible confounding effects at the bank-year level. The results are similar to those reported in column (2) and suggest that banks more exposed to stress-test shocks are more likely to exit risky markets. Despite dramatic increase in R^2 stemming from adding bank-year fixed effect, the interaction term coefficients retain their economic magnitude and statistical significance. The estimate reported in column (3) of Panel A suggests that in response to a one standard deviation increase in *Stress test shock* in Tier 1 capital (1.7%), markets in top quartile of the employment beta distribution (= 1.36) would see 1.6% greater decline in small business loan originations than those in the bottom beta quartile (= 0.96).[15] These magnitudes are roughly twice as large using the leverage ratio.

In Table 3, we augment this analysis to evaluate whether we would observe a differential effect of stress-testing on lending quantities in markets where banks have an informational advantage through a branch presence. Columns (1) and (2) report the results where the data are confined to counties where subsidiary banks have at least one branch. Columns (3) and (4) evaluate the small business lending sensitivity to *Stress-test shock*s in counties where subsidiary banks do not have branches. We find that the adverse effect of *Stress-test shock* on loan quantities is pronounced in non-local markets yet virtually non-existent (statistically and economically) in local markets where banks have branches.

Overall, the evidence provided in Tables 2 and 3 offers a direct link between declines in small business loan originations and *Stress-test shock*s. Moreover, the effect on quantities of loans supplied is more pronounced in riskier markets and in markets where banks lack local knowledge.

III.B. The Effect of Stress Tests on Small Business Loan Prices

While the previous section evaluates the effect of *Stress-test shock* on small business loan quantities, this section offers complementary analysis of loan prices based on the confidential 2013-2016 STBL data.

The STBL Data

To obtain timely information on the business lending environment, the Federal Reserve has instituted the *Survey of Terms of Business Lending* (STBL). The STBL collects data on loans originated by a random sample of banks during a full business week every three months (February,

[15] The calculation equals the interaction term's coefficient multiplied by (1.7*(1.36-0.96)).

May, August and November). The selection of banks is conducted in a way that creates representative sample of C&I loans. Consequently, the large banks are more likely to be surveyed. The STBL data covers 26 out of 32 stress-tested BHCs.

The STBL provides detailed loan characteristics including loan size, the nominal interest rate, maturity, whether or not the loan comes with a pre-payment penalty, collateral status, whether these loans reflect a drawdown on a pre-arranged line of credit, the state of the borrower, etc. Given our focus on small business loans, we consider only originations with commitment amounts under $1 million. Furthermore, to focus on new credit creation, we exclude from consideration the drawdowns on existing lines of credit.

In addition to these characteristics, the STBL reports the lender's internal risk rating for each loan. The rating that we use ranges from 1 to 4, with 1 representing loans with the lowest risk level and 4 representing those with the highest risk.[16] While the risk ratings are reported by the banks independently, the Federal Reserve provides instructions on how to make the ratings consistent across institutions. It is still possible, however, that risk ratings are not fully compatible across banks.

Similar to CRA, the STBL collects data at the subsidiary-bank level due to the regulatory authority in evaluating lending at the individual bank level rather than at the parent financial institution level. Hence, similar to CRA analysis, we track subsidiary bank financial characteristics potentially affecting lending decisions based on quarterly Call Reports. Specifically, we use the nearest Call Report date *prior* to each STBL survey date. For example, we merge the June 2012 Call Report data into the STBL survey taken in August of 2012. We then merge the quarterly

[16] The STBL also includes loans with a '0' rating, which indicates unrated loans, and loans rated '5' which indicates defaulted loans. We drop these two categories.

subsidiary-bank-level STBL data to the annual BHC-level *Stress-test shocks* on a rolling basis. Since we want the *Stress-test shock* to be pre-determined with respect to our outcomes from the STBL, we map the most recent data from a given stress test disclosure into the next four STBL quarterly surveys. So, for example, we map the March 2012 value of *Stress-test shock* into STBL data from May 2012, August 2012, November 2012, and February 2013. We map the March 2013 value into the subsequent four STBL survey dates similarly, and so on.[17]

Panel C of Table 1 provides summary statistics for loan characteristics reported in the STBL data. An average loan in our sample is about $11,000, with maturity of about 15 months and an interest rate of 3.3%. About one-third of these loans are originated in the riskiest loan category (risk rating = 4). Consistent with relatively low interest rates, 81% of these loans are secured. Most of the loans are also made by local banks, with 66% originated within a bank's branch domain (i.e., the bank has a branch in the state of the borrower).

Evidence on Loan Pricing

We use the STBL data to evaluate the effect of *Stress-test shock*s on small business loan pricing. Our loan pricing regressions take the following form:

$$\text{Loan Interest Rate}_{l,i,s,t} = \beta_1 Stress\ Test\ Shock_{h,t-1} + \text{Loan Controls}_{l,i,s,t} + \quad \textbf{(5)}$$
$$+ \text{Bank Controls}_{i,t-1} + State \times Quarter\ FEs + \varepsilon_{l,i,s,t}$$

where the dependent variable equals the nominal interest rate on loan l originated by subsidiary bank i within BHC h in state s at time t.[18] The state-quarter fixed effects help remove unobserved heterogeneity such as variation in loan demand due to (state-specific) business conditions.

[17] The change in stress test timing in 2016 from March to June leads us to map the 2015 *stress-test shock* data into the next five (rather than four) STBL surveys.

[18] Note that STBL does not contain a borrower identifier, which renders capturing borrower heterogeneity with fixed effects impossible.

On the loan side, we control for the (log of) loan size and the bank's assessment of borrower risk, which varies from 1 to 4 (with 4 being the highest risk category). On the subsidiary-bank side, we control for the time-varying subsidiary-bank size (log of assets), as well as an indicator variable set to one if the bank has a branch in the borrower's state (*Local Lender*). Our coefficient of interest depends on a BHC-level shock, consequently we cluster the standard errors at the BHC-quarter level.

We further augment the model with other (possibly endogenous) loan-level variables. These include the log of maturity, an indicator for loans secured by collateral, an indicator for loans that are syndicated, an indicator for floating rate loans, an indicator for loans guaranteed by the Small Business Administration (SBA), and an indicator for loans with pre-payment penalties. We do not include bank fixed effects in the model because doing so would remove the vast majority of the relevant variation in the *Stress-test shock*. This is true both because our time series is short and also because *Stress-test shock* is quite persistent. Hence, we are explicitly getting identification from cross-sectional variation. In our view, this approach is the only reasonable one to take, but we recognize that leaving out bank fixed effects requires us to establish robustness to potentially omitted bank-level heterogeneity. Hence, we demonstrate that our coefficients of interest are not sensitive to include a large set of bank characteristics (beyond size).

Table 4 reports our first set of pricing results and utilizes all three measures of the *Stress-test shock* defined above. In the baseline specifications (columns 1, 4 and 7) we only control for subsidiary-bank size, borrower risk rating, the local lender indicator, log of loan size, and quarter effects. We intentionally do not control for other (possibly endogenous) non-price loan terms. In the second set of specifications we saturate the model with state-quarter effects (columns 2, 5 and

8); in the last set of specifications (columns 3, 6 and 9), we control for the non-price loan terms. By adding loan terms to the regressions, we lose about 1/3 of the sample.

The coefficient on *Stress-test shock* is positive and significant across all specifications, with magnitudes ranging from 0.15 to 0.57. Magnitudes are not sensitive to adding more granular fixed effects, but they consistently increase in the models that control for other loan terms. Column (1) implies that a one standard deviation increase in *Stress-test shock* (=1.7) would lead to an increase in the loan rate of 37 basis points (=1.7 x 0.218 x 100). This effect increases to about 53 basis points in the models with full set of loan controls. The coefficients are larger in columns 7-9, which use the Tier 1 Leverage Ratio, but the economic impact is similar because this measure has lower cross-bank variation (standard deviation = 1.3).

The coefficients on the non-price terms are consistent with existing empirical studies of loan rates. Larger loans have lower rates and loans rated riskier by the lender carry higher rates, longer maturity loans have higher rates and loans secured by collateral have lower rates.[19] The safest loans (risk category 1) tend to have interest rates about 100 basis points (=0.34 x (4-1)) lower than the interest rate on the riskiest loans (risk category 4). The coefficients on the *Local Lender* indicator variable suggest that interest rates on loans within subsidiary-bank branch domains are 25 to 50 basis points lower than interest rates on loans outside of the branch domain. The economic and statistical significance on the *Local Lender* indicator disappears, however, once we control for non-price loan-terms.[20]

Table 5 offers additional robustness tests and solidifies evidence on the effect of *Stress-test shock* on loan interest rates. Here we augment the set of control variables utilized in Table 4

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[19] On small business loans, see Berger and Udell (1990). For large loans, see Strahan (1999).

[20] These comparisons are difficult to interpret because a much larger fraction of non-local loans have missing values along the non-price dimensions.

to include subsidiary-bank, time-varying financial characteristics. For brevity, Table 5 only reports models based on Tier 1 capital. The unreported analysis based on the remaining two *Stress-test shock* measures produces economically and statistically similar results.[21] Controlling for the subsidiary-bank financial characteristics has little effect on the core coefficient of interest, which varies from 0.16 to 0.22 (relative to 0.19 in the comparable model from Table 4, column 2). Overall, the results suggest that in response to *Stress-test shock*s banks increase small business loans prices.

Loan Pricing in Local Markets

Table 6 adds the interaction between *Local Lender* and *Stress-test shock* to our core models*:*

$$\text{Loan Interest Rate}_{l,i,s,t} = \beta_1 Stress\ Test\ Shock_{h,t-1} + \beta_2 Stress\ Test\ Shock_{h,t-1} \times Local_{i,s,t} + \text{Loan Controls}_{l,i,s,t} + \text{Bank Controls}_{i,t-1} + State \times Quarter\ FEs + \varepsilon_{l,i,s,t} \quad \textbf{(6)}$$

where $Local_{i,s,t}$ is an indicator variable equal to one when bank i of BHC h has a branch in state s.

These results suggest that stress tests affect pricing more where banks have a local branch presence. The magnitude of the interaction is also stronger in models where we control for other loan terms. In markets with branches, an increase in *Stress-test shock* of one standard deviation (=1.7) would lead to an increase in the loan rate of about 55 basis points (=1.7 x (0.089+0.233) x 100), using the coefficients from column (1). In contrast, rates increase by only about 15 basis points where banks do not have branches (=1.7 x 0.089). Similar patterns emerge using *Stress-test shock* from the other capital metrics. The results are consistent with the notion that banks with

[21] The results are available upon request.

local knowledge are more able to increase prices when they can extract rents from borrowers due to their information advantage over potentially competing lenders.[22]

Loan Pricing and Borrower Risk

To capture heterogeneity in pricing responses based on the riskiness of a borrower, Table 7 reports estimates of Equation (6) for three sub-samples broken out by borrow risk. Panel A reports the regression results for safe loans, those rated 1 or 2.[23] Panel B reports results for medium-risk loans, those rated 3. Panel C reports results for highest risk loans, those rated 4.

Pricing of low-risk loans (Panel A) does not increase with a bank's *Stress-test shock.* If anything, the results suggest a small negative effect of exposure to the stress tests on pricing for safe loans that are local (summing the direct and interactive terms). This result provides suggestive (but not definitive) evidence that banks which are expected to lose a lot of equity capital under stressed scenarios skew their credit provision toward safer borrowers by lowering prices.

Prices of medium-risk (rated '3') and high-risk loans (rated '4'), however, *do* increase robustly with increases in a bank's *Stress-test shock.* The effect on prices in these two categories is also larger in areas where banks have a local branch presence. Moreover, the marginal effect of *Stress-test shock* on loan rates is greatest for the high-risk loans in local markets. For example, using Tier 1 Capital measure, an increase in *Stress-test shock* of one standard deviation would lead to an increase in the loan rate of about 70 basis points (=1.7 x (0.166+0.242) x 100) for high-risk local loans (Panel C, column 1); a similar increase in *Stress-test shock* would lead to an increase

[22] This differential response of prices can also be shown by splitting the sample based on whether or not a bank has a branch in the borrower's state. This latter approach is a bit less constrained, in that it allows all of the coefficients in the regression to vary across the two samples.

[23] We combine these two categories because the frequency of loans in the safest category is low (around 3% of the sample).

in the loan rate of about 53 basis points (=1.7 x (0.068+0.242) x 100) for medium-risk local loans (Panel B, column 1). Banks exposed to stress-test shocks increase the pricing of relatively high-risk loans in markets where they have informational advantage.

The STBL-based Evidence on Loan Quantities

So far we have documented that banks more affected by stress tests increase prices on risky, local loans. In contrast, they seem to decrease prices on low-risk loans. These findings therefore suggest that loan supply shifts *toward* safer borrowers due to the stress tests. Because banks are less able to raise prices on high-risk loans where they have little access to local information than where they do, we would expect a greater shift toward safety in these non-local markets. To test this notion, we model the relative quantities of loans in different risk categories as a function of the *Stress-test shocks*. We construct a new outcome variable - *Risky Share* - equal to the share of loans in the STBL originated in the riskiest category (risk rating = 4) at the bank-state level. If the observed price increase really come from a supply shift, then we ought to observe *Risky Share* decrease with *Stress-test shock*. If banks are unable to price risks in markets where they do not have information (i.e., in non-local markets), this shift ought to be larger.

To empirically investigate this, we estimate the following regression:

$$Risky\ Share_{i,s,t} = \beta_1 Stress\ Test\ Shock_{h,t-1} + \beta_2 Stress\ Test\ Shock_{h,t-1} \times Local_{i,s,t}$$
$$+\text{Avg Loan Controls}_{i,s,t} + \text{Bank Controls}_{i,t-1} + State \times Quater\ FEs + \varepsilon_{i,s,t} \qquad \textbf{(7)}$$

where $Risky\ Share_{i,s,t}$ is the volume share of loans in the highest loan risk category (=4) originated by bank i in state s in quarter t. Since these regressions are aggregated up to the bank-state level, we average the non-price terms across loans made in each bank-state for each survey date. As before, standard errors are clustered at BHC-year level.

Table 8 reports the analysis based on regression equation (7). Here, we regress *Risky Share* on *Stress-test shock*, along with bank size, the *Local Lender* indicator and interaction (*Stress-test shock x Local Lender*), along with state-time fixed effects. As before, we report each specification with and without non-price loan terms. The results strongly support the supply interpretation of the pricing results. For states where banks do not have branches, the coefficient on *Stress-test shock* is negative and significant, both statistically and economically. For example, a one standard-deviation increase in *Stress-test shock* is associated with a 6 to 10 percentage point decline in *Risky Share*. This represents an economically large decline relative to the average *Risky Share* of about 34 percent of the portfolio (recall Table 1). The effect, however, is smaller – and close to zero– in markets where banks have branches. For example, the F-test on the sum of the two coefficients (*Stress-test shock* and its interaction with the local lender indicator) is not statistically significant in any of the models (although it does sign negatively).[24] Hence, the ability to raise prices on risky loans allows banks to continue to provide credit, even when facing large losses under the stress test.

The results indicate that in markets where banks have relatively strong bargaining power with respect to their borrowers, due to things like location and access to private information, they tend to raise prices in response to the stress-test shock. In markets where their role as small business lender is more like a commodity – one, for example, that could be made by any lender irrespective of having a local physical presence – we see a very strong effect on quantities. Bottom line, banks

[24] These conclusions are similar based on models in which we separate the sample by whether or not the bank has branches in the state of the borrower. This latter approach allows all of the coefficients to vary with *local lender*.

affected by stress test shock reduce lending in markets where their comparative advantage is small, and raise prices where it is large.[25]

IV. Conclusion and Discussion

Our results suggest that banks more affected by stress tests reduce their willingness to supply loans to small business, and this reduction has been concentrated among relatively riskier small-business borrowers. The result helps explain patterns in aggregate lending to small business, which has not recovered to the levels seen before the 2008 Financial Crisis. But the result does not answer whether or not the change in supply stemming from the stress tests is good or bad for the economy. Credit conditions were loose during the years prior to 2008, not only in mortgage finance but also in other kinds of bank lending. This is evident in Figure 1, where small business originations grew rapidly in the early and mid-2000s. If banks were taking too much risk during these years and extending too much credit, in part due to ineffective capital requirements, then the advent of stress testing may have improved efficiency in the credit markets. Moral hazard incentives from deposit insurance and 'too big to fail' expectations are well known to potentially induce banks to supply too much risky credit. Regulations that accurately tie loan risk to required capital can help alleviate this problem; hence, the stress tests may be achieving this objective. On the other hand, advocates for banks argue that the stress tests have raised the implicit capital requirement on small business lending excessively – beyond the level justified by the risk. This would also be consistent with our findings, but with very different normative implications. Without

[25] An alternative explanation for the positive correlation between stress test exposure and loan rates for risky loans might be due to gaming. For example, if affected banks strategically reassign loans to lower risk bins (to game the test), this would leave only the riskiest loans in the highest-risk category. This explanation, however, does not explain the differences that we observe based on bank ownership of local branches.

better information on the details of the models used to assess lending risk across market segments, we hesitate to take a stand on these policy debates.

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Figure 1: Total Small Business Lending Originations

The Figure shows the total volume of small business loans originated by the Community Reinvestment Act (CRA) reporting banks in the USA, originated between 1997 and 2015. The data are aggregated to the national level from the CRA institution-level Disclosure Reports covering the lending activity of all institutions subject to CRA reported to the Federal Financial Institutions Examination Council (FFIEC).

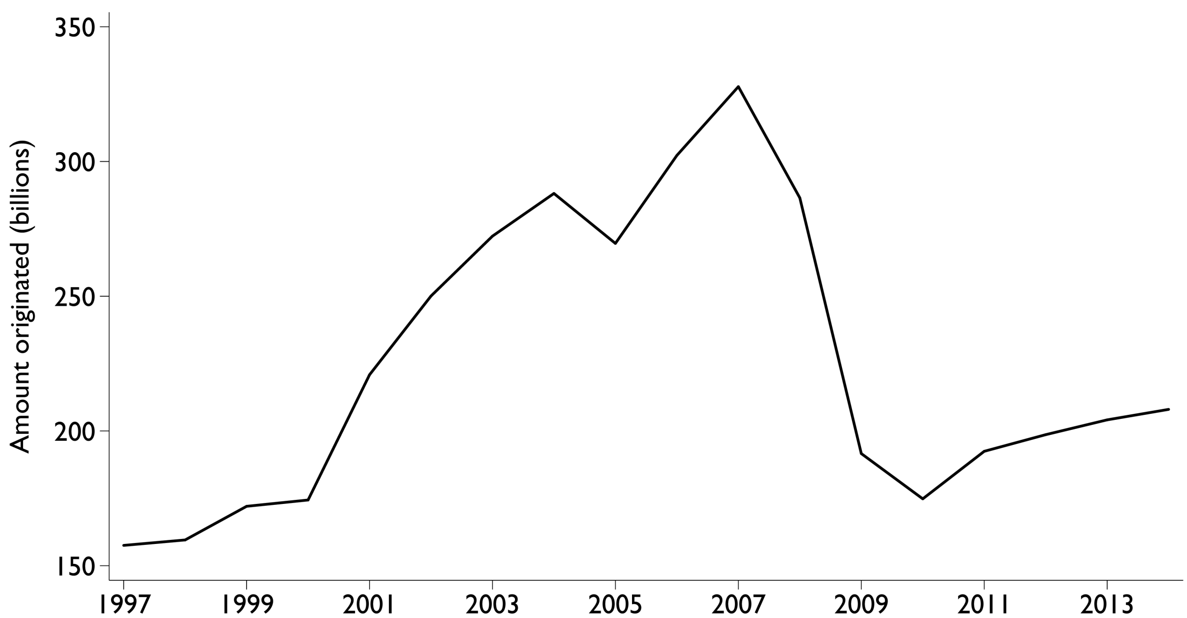

Figure 2: Total Outstanding C&I Loans

The Figure shows the total amount of outstanding commercial and industrial (C&I) loans split by loan size between years 1997 and 2014, indexed to year 1997. The data are from the Consolidated Reports of Condition and Income (Call Reports), reported in June of each year. Non-commercial banks, foreign controlled banks (with foreign ownership larger than 25%) and banks with missing data for assets, loans, equity, and deposits are excluded.

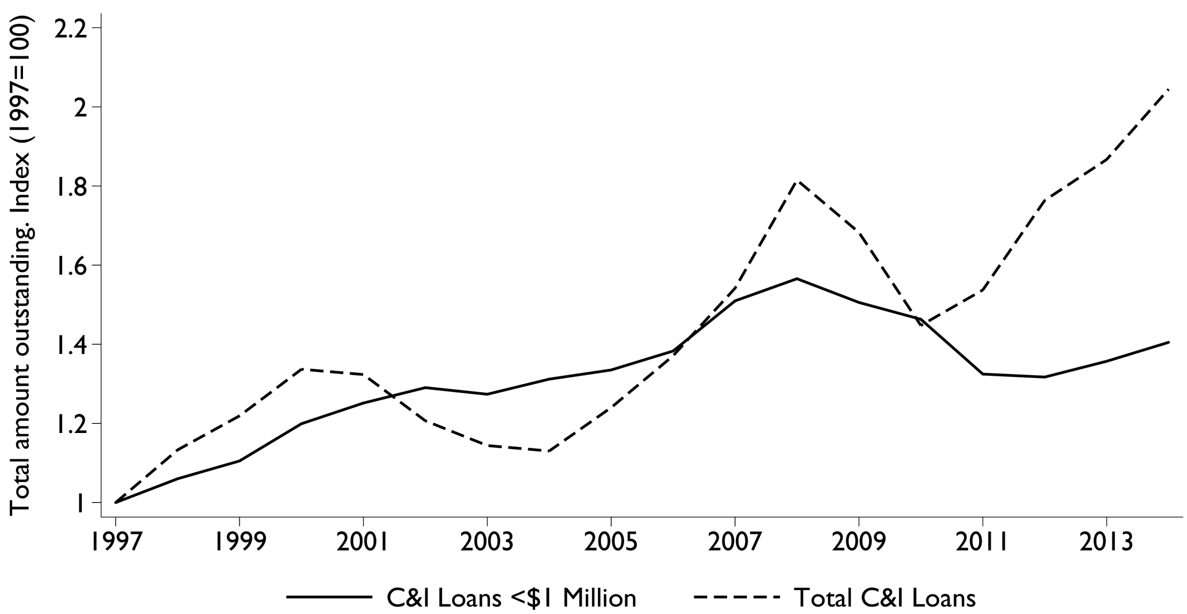

Table 1: Summary Statistics

This table reports summary statistics for the stress test shocks, bank characterisitcs, community reinvestment act (CRA) small business loan originations, and small business lending loan terms. Data sources are public release of the stress test results by the Federal Reserve, Consolidated Report of Condition and Income (call reports), CRA, and Survey of Terms of Business Lending (STBL), respectively. STBL data covers the period between 2013Q1 and 2016Q4, call reports and CRA data covers years 2012-2015

	Mean	Median	Standard Deviation
Panel A: Stress Test Shocks			
Stress Test Shock (Tier 1 Capital Shock)	3.35	2.80	1.71
Stress Tests Shock (Total Risk-Based Capital Shock)	3.37	3.10	1.74
Stress Test Shock (Tier 1 Leverage Shock)	2.63	2.30	1.29
Tier 1 Capital	13.42	12.70	2.95
Risk-Based Capital	16.17	15.52	3.03
Tier 1 Leverage	8.93	9.02	1.90
Panel B: Bank Characteristics			
Log of Bank Assets	19.41	19.00	1.15
Deposits / Total Liabilities	75.2%	77.2%	8.1%
NPL / Loans	1.4%	1.2%	1.2%
ROA	0.2%	0.2%	0.1%
C&I Loans / Assets	15.1%	15.2%	9.2%
Cash + Securities / Assets	33.9%	25.4%	17.4%
Growth in CRA Loans	-8.3%	-2.6%	52.7%
Panel C: STBL Loan Terms			
Loan Rate (percentage points)	3.29	3.25	1.27
Log of Loan Size ('000)	11.14	10.97	1.12
Maturity (months)	15.43	11.00	17.36
Rating (1=safest; 4=riskiest)	3.19	3.00	0.73
Share of Risky Loans (Rating = 4)	0.34	0.23	0.35
Local Lender? (Branch in Borrower's State)	66%	-	-
Loan is Secured?	87.1%	-	-
SBA Loan?	2.0%	-	-
Syndicated Loan?	13.3%	-	-
Prepayment Penalty?	9.5%	-	-
Floating Rate Loan?	92.5%	-	-
Panel D: Local Risk Measures			
Employment Beta	1.29	1.12	0.69

Table 2: The Effect of Stress Tests on Loan Growth by Market (CRA Data)

This table reports the results from the OLS regressions following equation (2). The dependent variable is the growth in small business loan originations by bank i in county c at time t, as reported by the CRA data and defined in equation (1). *Stress-Test shock* equals the difference between the starting value of the capital ratio at the outset of the stress test and the lowest capital ratio implied by the severely adverse stress scenario. County-year-level *Employment Beta* is calculated as the weighted average of industry betas based on the shares of different industries in a county (equation (2)). Bank-level controls are log of total assets, share of C&I loans in a bank total loan portfolio, share of non-performing loans in total loans, return on assets, share of deposits in total liabilities, and a bank's liquidity captured by the ratio of cash and marketable securities to assets. In all specifications we control for county times year fixed effects. In column (3) we replace all bank-level controls with bank times year fixed effects. The sample covers the period between 2012 and 2015. Standard errors are clustered by BHC-year.

	Dependent Variable = Growth in CRA Loan Originations		
	(1)	(2)	(3)
Panel A: Tier 1 Capital Shock			
Stress Test Shock	-0.008	0.027	
	(0.14)	(0.46)	
Stress Test Shock x County Employment Beta		-0.030**	-0.023**
		(2.28)	(2.05)
County x Year Effects	Yes	Yes	Yes
Other Bank Controls	Yes	Yes	-
Bank x Year Effects	-	-	Yes
Observations	101,153	101,133	102,539
R^2	0.20	0.20	0.57
Panel B: Total Risk-Based Capital			
Stress Test Shock	0.036	0.062	
	(0.64)	(1.12)	
Stress Test Shock x County Employment Beta		-0.022	-0.023**
		(1.66)	(2.10)
County x Year Effects	Yes	Yes	Yes
Other Bank Controls	Yes	Yes	-
Bank x Year Effects	-	-	Yes
Observations	101,153	101,133	102,539
R^2	0.20	0.20	0.57
Panel C: Leverage Ratio			
Stress Test Shock	0.064	0.125*	
	(1.00)	(1.75)	
Stress Test Shock x County Employment Beta		-0.052**	-0.050**
		(2.17)	(2.45)
County x Year Effects	Yes	Yes	Yes
Other Bank Controls	Yes	Yes	-
Bank x Year Effects	-	-	Yes
Observations	101,153	101,133	102,539
R^2	0.25	0.25	0.57

Table 3: The Effect of Stress Tests on Loan Growth in Local and Non-local Markets

This table reports the results from the OLS regressions following equation (4). The dependent variable is the growth in small business loan originations by bank i in county c at time t, as reported by the CRA data and defined in equation (1). *Stress-Test-Shock* equals the difference between the starting value of the capital ratio at the outset of the stress test and the lowest capital ratio implied by the severely adverse stress scenario. County-year-level *Employment Beta* is calculated as the weighted average of industry betas based on the shares of different industries in a county (equation (3)). We classify a county as a bank's *local* market if the bank has a branch in that county. Bank-level controls arelog of total assets, share of C&I loans in a bank total loan portfolio, share of non-performing loans in total loans, return on assets, share of deposits in total liabilities, and a bank's liquidity captured by the ratio of cash and marketable securities to assets. In all specifications we control for county times year fixed effects. In columns (2) and (4) we replace all bank-level controls with bank times year fixed effects. The sample covers the period between 2012 and 2015. Standard errors are clustered by BHC-year.

	Dependent Variable = Growth in CRA Loan Originations			
	(1)	(2)	(3)	(4)
	Local		Non-Local	
Panel A: Tier 1 Capital Shock				
Stress Test Shock	-0.062*		0.065	
	(1.72)		(0.94)	
Stress Test Shock x County Employment Beta	0.013	0.009	-0.042***	-0.028**
	(1.25)	(1.18)	(3.19)	(2.60)
County x Year Effects	Yes	Yes	Yes	Yes
Other Bank Controls	Yes	-	Yes	-
Bank x Year Effects	-	Yes	-	Yes
Observations	16,099	16,587	81,954	82,890
R^2	0.35	0.44	0.25	0.66
Panel B: Total Risk-Based Capital				
Stress Test Shock	-0.051		0.098	
	(1.61)		(1.48)	
Stress Test Shock x County Employment Beta	0.011	0.00633	-0.033**	-0.028***
	(0.93)	(0.71)	(2.50)	(2.66)
County x Year Effects	Yes	Yes	Yes	Yes
Other Bank Controls	Yes	-	Yes	-
Bank x Year Effects	-	Yes	-	Yes
Observations	16,099	16,587	81,954	82,890
R^2	0.35	0.44	0.25	0.66
Panel C: Leverage Ratio				
Stress Test Shock	-0.045		0.202**	
	(0.91)		(2.23)	
Stress Test Shock x County Employment Beta	-0.003	0.006	-0.080***	-0.059***
	(0.17)	(0.43)	(2.95)	(2.77)
County x Year Effects	Yes	Yes	Yes	Yes
Other Bank Controls	Yes	-	Yes	-
Bank x Year Effects	-	Yes	-	Yes
Observations	16,099	16,587	81,954	82,890
R^2	0.35	0.44	0.31	0.66

Table 4: The Effect of Stress Tests on Loan Interest Rates

This table reports the results from the OLS regressions following equation (5). The dependent variable is individual-level interest rate for each small business loan reported in the STBL. Stress-test-shock equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Loan Interest Rate (in Percentage Points)								
	Tier 1 Capital			Total Risk-Based Capital			Leverage Ratio		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Stress Test Shock	0.218***	0.192***	0.309***	0.176***	0.153***	0.286***	0.279***	0.243***	0.576***
	(3.37)	(3.81)	(4.51)	(3.02)	(3.56)	(4.76)	(2.83)	(3.17)	(5.30)
Log Loan Size	-0.132**	-0.162***	-0.080*	-0.135**	-0.164***	-0.079*	-0.137**	-0.165***	-0.101**
	(2.27)	(3.69)	(1.81)	(2.28)	(3.75)	(1.76)	(2.35)	(3.75)	(2.49)
Log Bank Assets	-0.064	-0.064	0.051	-0.05	-0.046	0.07	0.008	0.006	0.126*
	(1.02)	(1.34)	(0.67)	(0.77)	(0.90)	(0.84)	(0.14)	(0.15)	(1.93)
Rating (1=safest; 4=riskiest)	0.337***	0.341***	0.335***	0.337***	0.342***	0.340***	0.327***	0.335***	0.305***
	(4.62)	(4.83)	(5.46)	(4.58)	(4.80)	(5.46)	(4.67)	(4.82)	(5.17)
Local Lender	-0.372***	-0.255**	0.081	-0.535***	-0.407***	0.065	-0.443***	-0.329***	0.01
	(3.55)	(2.57)	(0.82)	(4.85)	(4.24)	(0.68)	(3.86)	(3.09)	(0.11)
Log Maturity			0.130***			0.127***			0.136***
			(2.96)			(2.87)			(3.20)
Loan is Secured?			-0.211**			-0.198*			-0.211**
			(2.03)			(1.80)			(2.29)
SBA Loan?			1.719***			1.785***			1.602***
			(8.23)			(8.31)			(7.44)
Syndicated Loan?			-0.197			-0.213			-0.134
			(1.42)			(1.47)			(1.09)
Pre Payment Penalty?			-0.991***			-0.948***			-1.121***
			(5.77)			(5.34)			(7.34)
Floating Rate Loan?			0.305*			0.308*			0.004
			(1.85)			(1.80)			(0.04)
Quarter Effects	Yes	-	-	Yes	-	-	Yes	-	-
State x Quarter Effects	-	Yes	Yes	-	Yes	Yes	-	Yes	Yes
R^2	0.17	0.24	0.33	0.16	0.23	0.32	0.16	0.24	0.36
Number of observations	340,333	336,141	205,703	340,333	336,141	205,703	340,333	336,141	205,703

Table 5: The Effect of Stress Tests on Loan Interest Rates, Robustness to Other Bank Characteristics

This table reports the results from the OLS regressions following equation (5). The dependent variable is individual-level interest rate for each small business loan reported in the STBL. *Stress-Test-Shock* equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Loan Interest Rate (in Percentage Points)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stress-Test-Shock (Tier 1 Capital)	0.193***	0.185***	0.199***	0.158***	0.222***	0.203***	0.157***
	(3.85)	(3.83)	(3.86)	(3.80)	(4.47)	(3.86)	(4.58)
Log Loan Size	-0.162***	-0.172***	-0.168***	-0.167***	-0.160***	-0.161***	-0.194***
	(3.69)	(3.87)	(3.80)	(4.14)	(3.65)	(3.66)	(4.83)
Log Bank Assets	-0.065	-0.053	-0.189	-0.005	0.087	-0.035	0.355***
	(1.23)	(1.14)	(1.45)	(0.09)	(1.25)	(0.54)	(2.85)
Rating (1=safest; 4=riskiest)	0.341***	0.336***	0.334***	0.329***	0.357***	0.342***	0.338***
	(4.85)	(4.79)	(4.58)	(4.48)	(5.17)	(4.90)	(4.83)
Local Lender	-0.256**	-0.443***	-0.324***	-0.336***	0.05	-0.222**	-0.368***
	(2.54)	(4.17)	(3.02)	(2.94)	(0.46)	(2.11)	(4.13)
Initial Capital Ratio	-0.001	0.04	0.008	-0.007	-0.043	-0.006	0.034
	(0.03)	(0.68)	(0.15)	(0.14)	(1.01)	(0.12)	(0.69)
Deposits / Total Liabilities		1.436*					4.135***
		(1.73)					(4.44)
NPL / Loans			12.289				-3.771
			(0.97)				(0.39)
ROA				-225.605**			-360.732***
				(2.26)			(3.89)
C&I Loans / Assets					3.717***		6.795***
					(4.38)		(4.05)
Cash + Securities / Assets						-0.571	0.466
						(1.11)	(0.53)
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.24	0.24	0.24	0.25	0.25	0.24	0.29
Observations	336,141	336,141	336,141	336,141	336,141	336,141	336,141

Table 6: The Effect of Stress Tests on Local Branch Loan Interest Rates

This table reports the results from the OLS regressions following equation (6). The dependent variable is individual-level interest rate for each small business loan reported in the STBL. *Stress-Test-Shock* equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. The Stress-Test-Shock is based on the Tier 1 Capital in columns (1) and (2), total risk-based capital in columns (3) and (4), and leverage ratio in columns (5) and (6). Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Loan Interest Rate (in Percentage Points)					
	Tier 1 Capital		Total Risk-Based Capital		Leverage Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
Stress Test Shock	0.089***	0.150**	0.057**	0.158***	0.114**	0.391**
	(2.72)	(2.48)	(2.25)	(2.75)	(2.44)	(2.36)
Local Lender?	-1.008***	-0.583***	-1.132***	-0.504***	-1.249***	-0.508*
	(6.43)	(3.85)	(6.09)	(3.51)	(6.20)	(1.88)
Local Lender x Stress Test Shocl	0.233***	0.218***	0.225***	0.174***	0.343***	0.220**
	(4.43)	(5.13)	(4.25)	(4.37)	(4.13)	(2.19)
Rating (1=safest; 4=riskiest)	0.332***	0.323***	0.338***	0.331***	0.322***	0.301***
	(4.71)	(5.35)	(4.75)	(5.37)	(4.64)	(5.14)
Log Loan Size	-0.168***	-0.084*	-0.169***	-0.081*	-0.180***	-0.102**
	(3.96)	(1.89)	(4.05)	(1.82)	(4.22)	(2.50)
Log Bank Assets	-0.123**	0.025	-0.097*	0.052	-0.014	0.118*
	(2.27)	(0.32)	(1.72)	(0.62)	(0.34)	(1.87)
Log Maturity		0.129***		0.125***		0.138***
		(2.99)		(2.86)		(3.29)
Loan is Secured?		-0.194*		-0.184		-0.204**
		(1.87)		(1.65)		(2.22)
SBA Loan?		1.698***		1.777***		1.589***
		(8.16)		(8.29)		(7.42)
Syndicated Loan?		-0.16		-0.186		-0.126
		(1.16)		(1.27)		(1.03)
Pre Payment Penalty?		-0.988***		-0.942***		-1.123***
		-5.79		-5.3		-7.42
Floating Rate Loan?		0.322*		0.324*		-0.009
		(1.94)		(1.87)		(0.07)
R^2	0.25	0.33	0.25	0.33	0.25	0.36
Number of observations	336,141	205,703	336,141	205,703	336,141	205,703
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: The Effect of Stress Tests on Loan Interest Rates by Risk Rating

This table reports the results from the OLS regressions following equation (6). The dependent variable is individual-level interest rate for each small business loan reported in the STBL.*Stress-Test-Shock* equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. We split our sample by the loan*Risk Rating* groups, where rating equal to one representing the lowest loan risk. Risk ratings are assigned by each bank for their indivual loans and are mapped to a scale from the Federal Reserve for better comparison across banks. The Stress-Test-Shock is based on the Tier 1 Capital in columns (1) and (2), Total risk-based capital in columns (3) and (4), and leverage ratio in columns (5) and (6). Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects. Standard errors are clustered by bank-year.

	Dependent Variable = Loan Interest Rate (in Percentage Points)					
	Tier 1 Capital		Total Risk-Based Capital		Leverage Ratio	
Panel A: Low Risk Loans (Rating = 1 or 2)						
Stress Test Shock	-0.002	-0.012	-0.011	0.001	0.026	-0.004
	(0.09)	(0.62)	(0.57)	(0.06)	(0.86)	(0.07)
Local Lender?	-0.238	0.143	-0.298**	-0.02	-0.006	0.086
	(1.51)	(0.88)	(2.10)	(0.14)	(0.03)	(0.39)
Local Lender x Stress Test Shock	-0.066	-0.048	-0.044	0.006	-0.157**	-0.035
	(1.50)	(1.14)	(1.12)	(0.16)	(2.49)	(0.42)
R^2	40.9%	42.8%	40.9%	42.7%	41.1%	42.7%
Number of observations	51,085	19,616	51,085	19,616	51,085	19,616
Loan Characteristics	No	Yes	No	Yes	No	Yes
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Medium Risk Loans (Rating = 3)						
Stress Test Shock	0.068**	0.068	0.046**	0.075*	0.087**	0.392***
	(2.60)	(1.64)	(2.33)	(1.91)	(2.22)	(3.40)
Local Lender?	-1.095***	-1.173***	-1.186***	-1.104***	-1.418***	-1.001***
	(6.46)	(6.91)	(6.01)	(6.90)	(5.99)	(4.20)
Local Lender x Stress Test Shock	0.242***	0.310***	0.224***	0.262***	0.390***	0.305***
	(4.23)	(5.96)	(3.95)	(5.59)	(3.68)	(3.56)
R^2	34.8%	38.3%	34.2%	37.7%	35.2%	42.5%
Number of observations	164,115	102,251	164,115	102,251	164,115	102,251
Loan Characteristics	No	Yes	No	Yes	No	Yes
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: High Risk Loans (Rating = 4)						
Stress Test Shock	0.166***	0.316***	0.120***	0.325***	0.194***	0.463***
	(3.54)	(3.72)	(3.04)	(3.88)	(2.95)	(3.56)
Local Lender?	-0.852***	-0.051	-1.060***	0.058	-0.983***	-0.11
	(3.93)	(0.32)	(4.35)	(0.30)	(4.11)	(0.62)
Local Lender x Stress Test Shock	0.242***	0.064	0.253***	0.016	0.305***	0.105
	(3.69)	(1.25)	(3.98)	(0.28)	(3.59)	(1.49)
R^2	0.21	0.34	0.20	0.33	0.19	0.35
Number of observations	120,941	83,836	120,941	83,836	120,941	83,836
Loan Characteristics	No	Yes	No	Yes	No	Yes
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: Share of High-Risk Loans

This table reports the results from the OLS regressions following equation (7). The dependent variable is *Risky Share* , which is defined as the share of high-risk (rating = 4) loans originated by bank i in state s during year t as reported in the STBL. *Stress-Test-Shoc* k equals the difference between the starting value of the capital ratio at the outset of the test and the lowest capital ratio implied by the severely adverse stress scenario. The Stress-Test-Shock is based on the Tier 1 Capital in columns (1) and (2), Total risk-based capital in columns (3) and (4), and leverage ratio in columns (5) and (6). Other control variables are listed in the left column. Sample covers the time between 2013Q1 and 2016Q4. In all specifications we control for state times year-quarter fixed effects. t-statistics based on the robust standard errorts are reported in parentheses.

	Dependent Variable = Share of Loans in Risk Category = 4					
	Tier 1 Capital		Total Risk-Based Capital		Leverage Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)
Stress Test Shock	-0.047***	-0.037***	-0.040***	-0.034***	-0.074***	-0.069**
	(-5.37)	(-4.61)	(-5.15)	(-4.38)	(-3.48)	(-2.44)
Local Lender?	-0.130**	-0.173***	-0.083*	-0.145**	-0.154***	-0.195***
	(-2.64)	(-2.83)	(-1.92)	(-2.44)	(-2.65)	(-3.02)
Local Lender x Stress Test Shock	0.033**	0.034**	0.018	0.022*	0.064**	0.057**
	(2.18)	(2.25)	(1.53)	(1.70)	(2.50)	(2.21)
Log Bank Assets	0.047**	0.061**	0.051**	0.064**	0.038	0.057**
	(2.05)	(2.11)	(2.28)	(2.27)	(1.60)	(2.01)
Average Log Maturity		-0.001*		-0.001*		-0.001
		(-1.77)		(-1.79)		(-0.75)
Fraction of Secured Loans		-0.027		-0.035		-0.023
		(-0.35)		(-0.45)		(-0.29)
Fraction of SBA Loans		0.07		0.072		0.079
		(0.58)		(0.58)		(0.70)
Fraction of Syndicated Loans		-0.117		-0.119		-0.161*
		(-1.44)		(-1.50)		(-1.91)
Fraction of Loans with Pre Payment Penalty		-0.111		-0.116		-0.106
		(-1.60)		(-1.63)		(-1.52)
Fraction of Loans with a Floating Rate		0.228***		0.231***		0.255***
		(4.78)		(4.80)		(5.10)
R^2	0.17	0.22	0.16	0.22	0.14	0.21
Observations	5,837	4,888	5,837	4,888	5,837	4,888
State x Quarter Effects	Yes	Yes	Yes	Yes	Yes	Yes